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09/336,126 06/18/99 REN

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| EXAMINER |
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MIGGINS, M

| ART UNIT | PAPER NUMBER |
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1772

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DATE MAILED:

02/21/01

Please find below and/or attached an Office communication concerning this application or proceeding.

Commissioner of Patents and Trademarks

Office Action Summary

Application No.

09/336,126

Applicant(s)

Ren et al.

Examiner

Mike Miggins

Group Art Unit

1772



☒ Responsive to communication(s) filed on 6/18/99

☐ This action is FINAL.

☐ Since this application is in condition for allowance except for formal matters, **prosecution as to the merits is closed** in accordance with the practice under *Ex parte Quayle*, 35 C.D. 11; 453 O.G. 213.

A shortened statutory period for response to this action is set to expire 3 month(s), or thirty days, whichever is longer, from the mailing date of this communication. Failure to respond within the period for response will cause the application to become abandoned. (35 U.S.C. § 133). Extensions of time may be obtained under the provisions of 37 CFR 1.136(a).

Disposition of Claim

- ☒ Claim(s) 1-86 is/are pending in the application.
- Of the above, claim(s) 40-77 and 79-86 is/are withdrawn from consideration.
- ☐ Claim(s) _____ is/are allowed.
- ☒ Claim(s) 1-39 is/are rejected.
- ☐ Claim(s) _____ is/are objected to.
- ☒ Claims 1-86 are subject to restriction or election requirement.

Application Papers

- ☒ See the attached Notice of Draftsperson's Patent Drawing Review, PTO-948.
- ☐ The drawing(s) filed on _____ is/are objected to by the Examiner.
- ☐ The proposed drawing correction, filed on _____ is ☐ approved ☐ disapproved.
- ☐ The specification is objected to by the Examiner.
- ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. § 119

- ☐ Acknowledgement is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d).
- ☐ All ☐ Some* ☒ None of the CERTIFIED copies of the priority documents have been
- ☐ received.
- ☐ received in Application No. (Series Code/Serial Number) _____.
- ☐ received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

*Certified copies not received: _____

- ☒ Acknowledgement is made of a claim for domestic priority under 35 U.S.C. § 119(e).

Attachment(s)

- ☒ Notice of References Cited, PTO-892
- ☒ Information Disclosure Statement(s), PTO-1449, Paper No(s). 4-6 and 8
- ☒ Interview Summary, PTO-413
- ☒ Notice of Draftsperson's Patent Drawing Review, PTO-948
- ☐ Notice of Informal Patent Application, PTO-152

— SEE OFFICE ACTION ON THE FOLLOWING PAGES —

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DETAILED ACTION

Election/Restriction

1. Restriction to one of the following inventions is required under 35 U.S.C. 121:
 - I. Claims 1-39, drawn to a product containing nano-tubes, classified in class 428, subclass 36.9+.
 - II. Claims 40-77, drawn to a method for forming a product containing nano-tubes, classified in class 423, subclass 447.7.
2. The inventions are distinct, each from the other because of the following reasons:

Inventions II and I are related as process of making and product made. The inventions are distinct if either or both of the following can be shown: (1) that the process as claimed can be used to make other and materially different product or (2) that the product as claimed can be made by another and materially different process (MEP. § 806.05(f)). In the instant case the product could be made by catalytic methods or an arc-discharge method or a deposition method.
3. Because these inventions are distinct for the reasons given above and have acquired a separate status in the art as shown by their different classification, restriction for examination purposes as indicated is proper.
4. Because these inventions are distinct for the reasons given above and the search required for Group II is not required for Group I, restriction for examination purposes as indicated is proper.

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5. Because these inventions are distinct for the reasons given above and have acquired a separate status in the art because of their recognized divergent subject matter, restriction for examination purposes as indicated is proper.

6. This application contains claims directed to the following patentably distinct species of the claimed invention: a field emission display, an electron emitter, a scanning electron microscope, a battery, a fuel cell, a composite, a high temperature superconductor, an electromagnetic interference shield and a microelectrode.

Applicant is required under 35 U.S.C. 121 to elect a single disclosed species for prosecution on the merits to which the claims shall be restricted if no generic claim is finally held to be allowable. Currently, claims 1-39 are generic.

Applicant is advised that a reply to this requirement must include an identification of the species that is elected consonant with this requirement, and a listing of all claims readable thereon, including any claims subsequently added. An argument that a claim is allowable or that all claims are generic is considered nonresponsive unless accompanied by an election.

Upon the allowance of a generic claim, applicant will be entitled to consideration of claims to additional species which are written in dependent form or otherwise include all the limitations of an allowed generic claim as provided by 37 CFR 1.141. If claims are added after the election, applicant must indicate which are readable upon the elected species. MEP. § 809.02(a).

Should applicant traverse on the ground that the species are not patentably distinct, applicant should submit evidence or identify such evidence now of record showing the species to

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be obvious variants or clearly admit on the record that this is the case. In either instance, if the examiner finds one of the inventions unpatentable over the prior art, the evidence or admission may be used in a rejection under 35 U.S.C. 103(a) of the other invention.

7. During a telephone conversation with Ted Murkle on 2/9/01 a provisional election was made with traverse to prosecute the invention of group I, claims 1-39 and the species, a field emission display, claim 78. Affirmation of this election must be made by applicant in replying to this Office action. Claims 40-77 are withdrawn from further consideration by the examiner, 37 CFR 1.142(b), as being drawn to a non-elected invention.

8. Applicant is reminded that upon the cancellation of claims to a non-elected invention, the inventorship must be amended in compliance with 37 CFR 1.48(b) if one or more of the currently named inventors is no longer an inventor of at least one claim remaining in the application. Any amendment of inventorship must be accompanied by a petition under 37 CFR 1.48(b) and by the fee required under 37 CFR 1.17(I).

Claim Rejections - 35 USC § 112

9. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

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10. Claim 78 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 78 is indefinite because it is very vague as to what applicant is actually claiming. It appears as though applicant is trying to claim 5 different species (lines 5-12) of a field emission display. Applicant recites in lines 3-5, "...a phosphor coated plate spaced apart from the baseplate so that electrons emitted from the array impinge on the phosphor coating, wherein the baseplate comprises a substrate and either...", applicant then goes on in lines 5-12 to recite five different species such as, for example, "... (4) a plurality of substantially aligned carbon nanotubes originating and extending outwardly from an outer surface..." (lines 9-11) and "... (5) one or more free-standing carbon nanotubes originating and extending outwardly from an outer surface of the substrate." (lines 11-12). Because of the term "either" in line 5 followed by 5 different species, it is unclear exactly what applicant is claiming.

Claim Rejections - 35 USC § 102

11. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless --

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(c) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who

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has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371© of this title before the invention thereof by the applicant for patent.

12. Claims 37-39 are rejected under 35 U.S.C. 102(b) as being anticipated by Ajayan et al. (U.S. Patent No. 5,457,343).

Ajayan et al. teach a product comprising a substrate (31) having an outer surface and a plurality of substantially aligned carbon nontubes (32) originating and extending outwardly from the outer surface, or a substrate having an outer surface and one or more free-standing carbon nanotubes originating and extending from the outer surface (abstract, column 12, lines 50-67 and Fig. 3) (applies to instant claims 38-39). Although Ajayan et al. do not specifically teach that the substrate has a strain point or melting point temperature between about 300 to 700 degrees Celsius, Ajayan et al. do teach the use of a glass substrate (31) which is one of the substrates chosen by applicant (page 8, lines 3-10), thus the limitation is inherent in the teachings of Ajayan et al. (applies to instant claim 37).

13. Claim 78 is rejected under 35 U.S.C. 102(e) as being anticipated by Debe (U.S. Patent No. 5,726,524).

Debe teaches a field emission display comprising a baseplate (14) having an electron emitting array (12) positioned thereon and a phosphor (23) coated plate spaced apart from the baseplate wherein the baseplate comprises one or more free-standing carbon nanotubes originating and extending outwardly from an outer surface of the substrate (column 7, lines 34-44, column 8, lines 22-43, column 14, lines 38-67 and Figs. 3(a-b)).

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Claim Rejections - 35 USC § 103

14. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

15. Claims 1-37 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ajayan et al. (U.S. Patent No. 5,457,343) in view of Chen et al. (*Chemical Physics Letters*, vol. 272, pgs. 178-182).

Ajayan et al. teach a product comprising a plurality of substantially aligned carbon nanotubes attached to a substrate, wherein the carbon nanotubes extend outwardly from and substantially perpendicular to the substrate, or at a non-perpendicular angle with respect to the substrate, or substantially parallel to the substrate, wherein the nanotubes have a diameter of at least 50 nanometers, wherein the substrate comprises glass, further comprising a filling within the carbon nanotubes, wherein substantially all carbon nanotubes have an open end, wherein the filling is lithium ions, a pharmacological agent (beta carotene) and wherein the filling is enclosed within the carbon nanotubes (abstract, column 2, lines 45-67, column 3, lines 1-35, column 5, lines 1-67, column 6, lines 1-12, column 11, lines 48-67, column 12, lines 50-67 and Figs. 1-3) (applies to instant claims 1-6, 9-10, 15-26, 29-30 and 32-36).

Ajayan et al. disclose the claimed invention except for the carbon nanotubes being present in an areal density of 10^4 or $10^2/\text{mm}^2$. It would have been obvious to one having ordinary skill in

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the art at the time the invention was made to fabricate a product wherein the carbon nanotubes are present in an areal density of 10^4 or $10^2/\text{mm}^2$ in order to optimize either magnetic, or electrical, or optical properties or prevent intercalation of foreign materials into the spaces in between the carbon nanotubes, since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering an optimum value of a result effective variable involves only routine skill in the art. *In re Boesch*, 617 F.2d 272, 205 USPQ 215 (CCPA 1980) (applies to instant claims 1 and 21). However, Ajayan et al. fail to specifically teach that the substrate has a strain point or melting point temperature up to about 3000 degrees Celsius, or about 300 degrees Celsius; moreover, Ajayan et al. fail to teach the substrate is a silicon wafer or nickel, substantially all carbon nanotubes have a cap distal from the substrate and wherein the cap is nickel.

Chen et al. teach a product wherein the substrate is a silicon wafer (page 181, column 2) or more preferably nickel (page 179, column 2, paragraph 2) which produces nano-tubes with a cap distal from the substrate wherein the cap is nickel (page 181, column 1 and Fig. 2) for the purpose of providing well-aligned graphitic nanofibers (page 178, column 2) (applies to instant claims 11-14 and 31). The substrate taught by Chen et al. is nickel, or glass in the case of the product of Ajayan et al., which is one of the substrates chosen by the applicant (page 8, lines 3-10) thus the strain point or melting temperature is inherent in the teachings of either Chen et al. or Ajayan et al. (applies to instant claims 7-8, 27-28 and 37).

It would have been obvious to one of ordinary skill in the art at the time applicant's invention was made to have provided a product wherein the substrate has a strain point or melting

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point temperature up to about 3000 degrees Celsius, or about 300 degrees Celsius, the substrate is a silicon wafer or nickel, substantially all carbon nanotubes have a cap distal from the substrate and wherein the cap is nickel in order to provide a product with well-aligned graphite nanotubes according to the teachings of Chen et al..


Conclusion

16. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Green et al. (U.S. Patent No. 5,346,683), Nolan et al. (U.S. Patent No. 5,780,101), Chang (U.S. Patent No. 5,916,642), Chen et al. (*Applied Physics Letters*, vol. 73(15), pgs. 2119-2121), Chen et al. (*Journal of Crystal Growth*, vol. 193, pgs. 342-346) are cited as relevant prior art.

Any inquiry concerning this communication should be directed to Mike Miggins whose telephone number is (703)305-0915. The examiner can normally be reached Monday to Friday from 1:30 PM to 10:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Harold Pyon, can be reached at (703)308-4251. The fax phone number for the organization where this application or proceeding is assigned is (703)305-3599.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist who's telephone number is (703)308-0661.


HAROLD PYON
SUPERVISORY PATENT EXAMINER
1772

3/20/01

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